

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : **09-312827**

(43)Date of publication of application : **02.12.1997**

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(51)Int.Cl. **H04N 5/91**  
**H04N 5/7826**

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(21)Application number : **08-149744** (71)Applicant : **SONY CORP**

(22)Date of filing : **22.05.1996** (72)Inventor : **YAMASHITA KEITARO**

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## **(54) RECORDING AND REPRODUCING DEVICE**

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a recording and reproducing device on which a proper image denoting a content of recorded broadcast program is displayed.

SOLUTION: After receiving a broadcast program received by an antenna 1 with a video channel selection tuner 2 the signal is converted into a digital signal a representative screen detection circuit 5 detects scene change information and gives the information to a 1st microcomputer 20. The scene change information is extracted by e.g. a motion detection circuit and depending on a broadcast program a field address of a commercial image is found out of the information detected by the motion detection circuit and several frames before and after the image are designated for an index display screen. The digital video signal is inputted to an encoder 8 in which image processing is conducted and the result is stored in a storage device 22 being a recording disk medium via a multiplexer 18 together with an audio signal. The index screen is displayed by the operation at reproduction to recognize the content of a recorded program and digest reproduction to reproduce the scene change screens is conducted so as to grasp the recording content.

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## **CLAIMS**

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[Claim(s)]

[Claim 1] Time information of a commercial message screen detected by reception means which receives a video signal detection means to detect a commercial message screen from a received video signal and said detection means or it has a recording device recorded on a recording medium with said video signal by making information relevant to this time information into additional information A recording and reproducing device provided with a control section displayed as an index display so that a representation screen located in front of said commercial message screen or/and in the back based on said additional information at the time of reproduction may be included as a still picture.  
[Claim 2] Time information of a commercial message screen detected by reception means which receives a video signal detection means to detect a commercial message screen

from a received video signal and said detection means or it has a recording device recorded on a recording medium with said video signal by making information relevant to this time information into additional information -- using this additional information at the time of reproductionA recording and reproducing device having a control section which carries out digest reproduction so that a representation screen located in front of a commercial message screen or/and in the back at least may be included as an animation more than 3 fields (or frame).

[Claim 3]The recording and reproducing device according to claim 1 or 2wherein a video signal recorded on said recording medium is used as a representation screen extracted by a motion detecting means.

[Claim 4]Address information relevant to time information or this time information of a commercial message screen detected as said additional information is recorded on a field which became independent of said video signalThe recording and reproducing device according to claim 1 or 2wherein a representation screen is set up by accessing a field where this additional information is recorded when there is a demand of index reproducing or digest reproduction at the time of reproduction.

[Claim 5]A recording and reproducing device given in claim 12or 4 recording both the start time / finish time of commercials as said additional information.

[Claim 6]Claims 1 and 2 recording either the start time or finish time of commercials as said additional information or the recording and reproducing device according to claim 4.

[Claim 7]The recording and reproducing device according to claim 12or 4 setting a representation screen as both in front of start time of a commercial message screen and after finish time of a commercial message screen as said additional information.

[Claim 8]The recording and reproducing device according to claim 4 recording said additional information on a TOC area of the recording medium itself.

[Claim 9]The recording and reproducing device according to claim 4 recording said additional information on a memory attached to a case of a recording medium.

[Claim 10]The recording and reproducing device according to claim 4 recording said additional information on a memory of a set carrying a recording medium.

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## **DETAILED DESCRIPTION**

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### **[Detailed Description of the Invention]**

#### **[0001]**

[Field of the Invention]After this invention recorded many programs and checking the contents of each program quicklyWhen saying that he would like to grasp the contents of the news on the 1st of the day or the specific program after going home for a short time with respect to the new recording and reproducing device of viewing and listening to the program which chose the program to watch and was chosen after that efficientlyit is related with a suitable recording and reproducing device. This invention relates to the recorder which records a broadcasting signal in large quantities and is reproduced.

Access nature is efficiently employed as a recording medium using a hard disk / optical disc / semiconductor memory and it is made to perform record reproduction efficiently.

#### **[0002]**

[Description of the Prior Art] Conventionally VTR is known as a recorder of a broadcasting signal. As a business-use way the recorder to the magneto-optical disc/optical disc is also put in practical use. This invention person aimed at reduction of the recording medium by recording the screen corresponding to a screen and an audio signal with a motion previously and he proposed the recording and reproducing device which these recorded contents can grasp to some extent as digest record recording the part on 1 in a program. (Japanese Patent Application No. No. 350751 [ seven to ]) [0003]

[Problem(s) to be Solved by the Invention] What asks for a representation screen by the method which detects change/motion using the histogram of the motion detection art proposed previously or the pixel value of a screen. Inability to detect it is enough and when two scenes change per frame (or field) it is practical enough by a method as it is.

However in the case of this motion detections since all the motions of a screen i.e. the case of a screen like a scene change throat are treated as change of an equivalent motion in the program in which commercials are contained in the program to which it is going to view and listen the frequency of a scene change becomes high by a commercial part.

Therefore in the digest screen which chose the representation screen and was \*\*\*\*(ed) based on the scene change compared with the program before a digest the information ratio of the commercial part increased relatively and there was a fault that the information on a program content decreased relatively. Although it generally has composition of the program that there is much information important before and after commercials in the program in which commercials are contained. In the case of the program containing commercials which were described above when the representation screen was set up only by scene change detection there was a problem that a representation screen could not be chosen effectively.

[0004]

[Means for Solving the Problem] In a program in which commercials are contained this invention. a representation screen being extracted using effectively a constitutional general tendency of a program that there is much information important before and behind a commercial message screen and therefore. A reception means which receives a video signal and a detection means to detect a commercial message screen from a received video signal. It has a recording device added and recorded on said video signal by making into additional information address information relevant to time information or this time information of a commercial message screen detected by said detection means etc. A recording and reproducing device was constituted with a control section which is based on said additional information at the time of reproduction displays a representation screen of in front of said commercial message screen or/and the back as an index display or a digest screen and is reproduced.

[0005] Time of a program which is going to view and listen to especially this invention to a commercial message screen (or time of a representation screen) or -- having a function which records address information of media corresponding to it as additional information -- this additional information -- a field of a recording medium -- or Since it is storables in a memory attached to a case of a recording medium and a specific memory in a set an index regenerative function or a digest reproduction function can be made to perform based on this additional information at the time of reproduction.

[0006]

[Function] By this invention the general tendency on \*\*\*\* of the program that there is much information important before and after commercials is effectively utilized in the program in which commercials are contained in a program. Therefore the quality of the index display/digest reproduction of a program can be raised.

[0007]

[Embodiment of the Invention] The typical block diagram of the device of this invention is shown in drawing 1 - drawing 3 below. Drawing 1 is an example in the case of making some circuits of a record signal-processing system serve a double purpose performing scene change detection (commercial detection) and storing the information on commercials (representation screen) in the memory of a set out of the program which received. It is possible that the scene change detection (commercial detection) circuit 5 (5') can make serve a double purpose and constitute some circuits of a record signal-processing system for example the motion detection circuit of a video encoder is used also [detection / bit reduction and / scene change]. It is an example in the case of having independently the scene change detection (commercial detection) 5 (5') out of a record signal-processing system in the case of drawing 2 and storing the information on commercials (representation screen) in the memory of a set and other circuits are the same as that of the case of drawing 1. Drawing 3 is an example of composition in the case of making some circuits of a record signal-processing system serve a double purpose using the scene change detection (commercial detection) 5 (5') and writing the information on commercials or a scene change (representation screen) in a recording medium with a video signal (audio signal) like drawing 1.

[0008] In these figures the broadcasting signal included in the receiving antenna shown by 1 is inputted into the video-signal tuner shown by 2 and the audio signal tuner shown by 13. The recording system of a video signal is explained first. DIJITAIKU [it / with the AD converter shown by four] after a video signal passes along the low pass filter (LPF) shown by 3. Synchronizing separation is performed by the synchronizing separator circuit 10. The position of the synchronizing separator circuit 10 shown in this example is an example and may carry out synchronizing separation of the signal after DIJITAIKU. The synchronized signal 11 obtained from the synchronizing separator circuit 10 is sent to the 1st microcomputer shown by 20 in order to make the time (or address) information on commercials (or representation screen) mentioned later. The signal [DIJITAIKU / signal / with AD converter 4] is inputted into the commercial (or scene change) detector circuit 5 (5') and detects commercials (or scene change).

[0009] The detecting method of a commercial message screen is explained below by drawing 4 mentioned later. The time or the address information 6 of a specific scene of a video signal obtained in the detector circuit 5 (5') is sent to the 1st microcomputer 20. With the 1st microcomputer 20 they are the synchronized signal 11 and commercials (or). The present inputted video signal judges the usual program information and the commercial information which has a scene change etc. from the information 6 (6') acquired in the scene change detector circuit 5 (5') and the timer which it has in. It is inputted into the encoder 8 as it is encoding of bit reductionsorting etc. is made and a video signal is outputted as the recorded video image signal 9.

[0010] Although the method of the above-mentioned encoding is not specified when controlling to choose the independent 1 field or one frame and to perform slide show

reproduction of a still picture it is required that a conclusion should be processed in a field (inside of the inside of the field / frame). When recording a short-time animation although using the coding method completed in a screen is called from the following frame (or field) the encoding method using compression of the time direction can also be used only for the first frame (or field).

[0011] Although it is also controllable to choose the independent 1 field or one frame as a representation screen in this control land to perform slide show reproduction of a still picture. The continuous number field - signal for several minutes can be chosen and digest reproduction which changes and displays a short animation can also be realized. although it is also possible to perform a representation instrument setup only before and after commercials be alike at the time of reproduction -- in order to perform a RISUMUSU screen display it is a range which the amount of recorded information allows and it is also possible to set a representation screen also to screens other than before and after commercials.

[0012] Although the method of choosing for every certain time interval when choosing representation screens other than before and after the commercials for digest reproduction is the easiest. It is more desirable to carry out control of lessening the screen to thin out using the information 6 acquired from a scene change detector circuit when the large screen of the motion continues relatively and increasing the screen which is a motion and which is thinned out to the scene near a still picture rather than small. Addition of index displays other than before and after commercials is also possible. Even if it faces this screen selection can also choose only based on the time interval between commercials but. If a scene with a scene change is chosen in the suitable time range between commercials using information 5' obtained from scene change detector circuit 5' validity can be improved more.

[0013] Next the audio signal detected by . voice tuner 13 explaining the speech signal processing of a recording system. After DIJITAIZU [ passing along the low pass filter 14 (LPF) and / with AD converter 15 ] it is encoded with the audio signal encoder 16 and becomes the one corded audio signal 17. And it inputs and acts to the multiplexer 18 as Multiplex of the encoded video signal 9 and the audio signal 17.

[0014] At this time also from the 1st microcomputer 20 the information about the time/address of the commercials of a video signal (or the time/address of a representation screen) is sent to the memory 38 and a memory is carried out in the form where correspondence with the address on a storage medium is attached. In the case of the method which stores the time/address of commercials in a memory at the time of record a representation instrument setup is performed based on this information at the time of reproduction. A representation instrument setup is performed at the time of record and the information is direct used in the method which stores its time/address at the time of reproduction. The signal by which the multiplexer was carried out by the multiplexer 18. After adding an error correction code (ECC) and processing channel coding etc. in the record circuit 19 which performs processing for recording on the storage device 22 it is recorded on the storage device 22 which consists of a hard disk an optical disc a semiconductor device etc.

[0015] Next the user operational input circuit 35 receives the operation which . user explaining a reversion system desires and the information 36 is given to the 2nd microcomputer 37. From the memory 38 the 2nd microcomputer 37 receives the

information 21C on the time/address of commercials (or the time/address of a representation screen) and it outputs the access control signal 39 to control/drive circuit 40 of storage so that the video information of a representation screen may be acquired.

[0016] As explained previously in the case of the method which stores the time/address of commercials in the memory 38 at this time the 2nd microcomputer 37 performs a representation instrument setup based on this information at the time of reproduction at the time of record. At the time of record a representation instrument setup is performed and the information is directly used by the method which stores its time/address at the time of reproduction. Storage control / drive circuit 40 which received the access control signal 39 reads the information which a user searches for from a storage medium with the signal 41 which controls the storage device 22. The read signal has channel coding and ECC solved in the regenerative circuit 23 for storage and is inputted into the demultiplexer 24. From the 2nd microcomputer 37 also to the demultiplexer 24 the demultiplexer control signal 42 is sent and AV synchronization at the time of reproduction and reproduction adapted to the function in which a video signal is called for are realized.

[0017] The video signal outputted from the demultiplexer 24 is decoded with the video-signal decoder 25 passes along the video signal processing circuit 26 and is outputted as the analog video signal 28 through DA converter 27. Of course it is also possible to output the digital signal 29 which does not let DA converter 27 pass according to the specification of the receiving set which receives a signal. The video signal processing circuit 26 performs graphics operations such as an onscreen display function etc. according to the control signal 43 from the 2nd microcomputer 37.

[0018] The audio signal outputted from the demultiplexer 24 on the other hand passes along the audio signal decoder 30 passes along the sound signal processing circuit 31 and is further outputted as the analog voice signal 33 through DA converter 32. It is the same as that of a video signal that it can have the digitized output 34 according to a relation with a connection destination. Although it is written in this example that it has two microcomputers it is a thing on expedient of explanation and this is possible also for processing the 1st microcomputer 20 and 2nd microcomputer 37 with one microcomputer collectively and it can divide a microcomputer into some and can also use the chip of two or more numbers.

[0019] Time of commercials (or representation screen) shown in drawing 3 (or) In the case of the method which writes an address for example specific area (TABLE OF CONTENTS) for example TOC on the recording medium of an optical disc this time/address information do not necessarily need to be written in real time. That is TOC area write-in information is stored in the memory of the 1st microcomputer 20 and it can collect at the time of the end of record of the interval of record of a video signal or the program of 1 \*\* and can write in. In order to write in time/address information by doing in this way a recording system circuit / head for exclusive use cannot be made to have.

[0020] Since commercials are detected the place by which it is characterized [ of this invention ] is at the point which can be set up not choose a representation screen from a commercial part also in a screen with a motion. And by this commercial detection digest reproduction except a commercial part is made possible.

[0021] Next the concrete method of commercial detection is explained. Two methods are

shown as an example of a commercial detection system. The first method is a method applicable in the U.S. etc. and is a method which detects the black burst screen inserted in the usual program and in the intervals of the Caux Marshall portion. The second method It is a method which can be used [ whole-world ] and is a method which performs scene change detection and usually distinguishes a program and commercials from the length of the interval of a scene change. It is known that the scene change interval in commercials is dramatically short compared with the scene change interval in the usual program. It can distinguish using this feature.

[0022]First the first method is explained using drawing 4. The usual program is drawing 4. - As shown in (a) a certain video signal is sent during the video signal. However in the specific country the field (field where the video signal level was fixed in the black level) where a video signal does not exist in this video-signal period as usually shown in drawing 4-(b) between a program and commercials is inserted. As for this in change in a program the case of the change to commercials from a program is also usually drawing 4 from commercials conversely. - It is inserted in (c). By detecting the field (field where the video signal level was fixed in the black level) where this video signal does not exist the pause by the program and commercials is usually detectable.

[0023]The example of the block diagram of the detector circuit of said 1st method is shown in drawing 5. The inputted video signal 51 is band-limited by the low pass filter (LPF) 52. This signal by which zone system dark circles were carried out is sent to the synchronizing signal separate circuit 54 and AD converter 65. In the synchronizing signal separate circuit 54 Vertical Synchronizing signal 57 and Horizontal Synchronizing signal 58 are detected in the Vertical Synchronizing signal detector circuit 55 and the Horizontal Synchronizing signal detector circuit 56 respectively. On the other hand the sampling clocks 61 of AD converter 65 are made in PLL circuit 59. The output of the clock generation machine 60 is counted down at the counter 62 it is compared by Horizontal Synchronizing signal 58 and the comparator 63 and a control signal is outputted from the control signal generator 64 based on this result. And the sampling clocks 61 locked in the Horizontal Synchronizing signal from the clock generation machine 60 which comprises VCO are produced. Vertical Synchronizing signal 57 Horizontal Synchronizing signal 58 and the sampling clocks 61 are sent to the gate pulse generator 67 and the gate pulse 68 for sampling only the video signal part except vertical blanking and level blanking is produced. This gate pulse 68 is sent to the gate circuit 69 and only a video signal part is extracted from the video signal [ DIJITAIZU / video signal ] 66. The level of this extracted video signal 70 is detected in the detector circuit 71. In the level detection circuit 70 if this level is fixed in the black level as stated previously it judges with "Dividing" and is considered as the information which detects beginning and the end of a commercial message screen.

[0024]Next the art in which the scene change detection which is the 2nd method performs commercials is explained. As a method of detecting a scene change the method of using motion detection and the method of using the histogram of \*\* of the pixel of a screen are known. Here motion detection art is explained as an example of the art of acquiring scene change information. The principle of motion detection art is explained first. Motion detection art is already put in practical use in MPEG etc. First explanation about blocking of a screen is performed using drawing 6. It is 1 as shown in drawing 6. A screen (80) is

divided into the block which consists of  $S \times S$  or a  $2 \times S$  pixel. It will express to a  $x$  direction the  $p$ -th and the  $q$ -th thing will be expressed in the block in a screen as  $B_{pq}$  to a  $y$  direction (81). Within a block the  $i$ -th is used in a  $x$  direction and  $**$  of the  $j$ -th pixel is set to  $A_{ij}$  in a  $y$  direction (82).

[0025] Usually as  $**$  of  $S$  the numerical value of involution of 4 and the 8 grade 2 is chosen. In explanation of drawing 6 although the block size of  $S \times S$  was illustrated since the same algorithm could be applied and generality was not lost also when the block of the pixel number in which length differs from width was used  $S \times S$  was only illustrated. The following explanation explains as a (screen = frame) in order to explain easily in a similar manner. Also when it is considered as the (screen = field) the same algorithm can be applied and generality is not lost.

[0026] Next the method of motion detection is explained using drawing 7. As shown in drawing 7 the inspection block (88) which serves as block  $B_{pq}$  (86) to perform motion detection in the present frame (85) to from the pixel number of  $S \times S$  in a reference frame (87) is set up and the difference is computed. A certain range including the position usually corresponding to [ as a place ] the position of a motion detection block of the present frame on a reference frame in this inspection block is set up. the inside of this search range (89) -- an inspection block (88) --  $x$  and  $y$  -- the difference of a block [ shifting by a pixel unit in the direction of each ] (86) to carry out motion detection in the present frame to and the inspection block (88) which consists of a pixel number of  $S \times S$  in a reference frame is computed. With the inspection block in a search range (89) the position in a screen makes the starting point the position which is equivalent to the position of a motion detection block (86) of a present frame in position Express a gap in  $x$  and a gap in a  $y$  direction with  $k$  and  $l$  respectively and  $**$  of the  $j$ -th pixel (83) to the  $x$  direction within a motion detection block in the  $i$ -th  $y$  direction  $A_{ij}$  Difference  $S_{pq}(kl)$  of the inspection block and motion detection block which are in the position of ( $k$  and  $l$ ) when it expresses to the  $x$  direction within the inspection block in the position of ( $k$  and  $l$ ) the  $i$ -th and  $**$  of the  $j$ -th pixel (54) is expressed as  $A_{ikj}$  to a  $y$  direction [Equation 1]

It becomes.

[0027] This calculation was performed and it was computed about ( $k$  and  $l$ ) of all in the search range (89) set up first. Among  $S_{pq}(s)(kl)**(KL)$  which shows the smallest  $**$  ( $kl$ ) is  $**$  of the "motion vector" about a present frame and this reference inter-frame motion detection block  $B_{pq}$ . The judgment about the number  $**$  et al. and change/motion of a screen which takes  $**$  below  $**$  with constant  $S_{pq}(k1)$  (or above) in  $**$  of this motion vector  $K$  and  $L$  and  $**$  of  $S_{pq}(kl)$  and 1 screen is possible.

[0028] For example when the still picture continues. Are set to  $K = 0$  and  $L = 0$  to all motion detection blocks of a present frame and when pan [ of the  $**$  of  $S_{pq}$  at this time ( $kl$ ) ] is being carried out to . used as zero and a transverse direction It is similarly set to  $K = C$  (const.) and  $L = 0$  to all the blocks and  $**$  of  $S_{pq}$  at this time ( $kl$ ) Since there is little deformation if the time between a reference frame and a present frame is short also when it becomes zero and the candidate for photography is moving slowly if it is the thing in which the candidate for photography stood it still it becomes small  $**$ . a grade only with  $S_{pq}(k1)$  of the portion which had big modification for a short time -- although big  $**$  is taken there are few the numbers. On the other hand since a screen in agreement does not

exist by inter-frame [ of 2 \*\* ] when a screen changes Spq (k and 1) takes big \*\* to \*\* of all (i and j).

[0029] Although this motion detection may be performed only to a luminance signal there are also a method of performing only to a color-difference signal and the method of performing to both a luminance signal / color-difference signal. The flow of the processing after detection of the scene change was performed is shown in drawing 8. It is thought most common that a microcomputer performs this processing. If scene detecting-signal 6' is inputted at Step 1 it will be computed at Step 2 using the timer of the 1st microcomputer 20 built-in the interval i.e. the scene length of a scene change. Based on the scene length computed at Step 3 the average value of the N newest scene length (N : one or more integers set up beforehand) is calculated. In order to avoid erroneous detection it is desirable to set N as two or more suitable numbers. If N is enlarged a detection delay will arise but since the detected information is actually used at the reproduction time this system does not require real time nature. This average value ( $t_n$ ) is compared with the SURESSHORUDO value ( $t_0$ ) beforehand set up at Step 4. Generally one scene change of commercials exists in 1 to 2 seconds and it is usually known also for a program with comparatively many scene changes like a news program in the program that it is about 7 to 10 seconds. Therefore if \*\* of SURESSHORUTO value  $t_0$  is set up become in this middle distinction with a program is usually as possible as commercials.

[0030]

[Effect of the Invention] When recording the program information transmitted for example with a broadcasting electric-wave or cable television on a recording medium by a proper means in the device which performs record reproduction of this invention a screen with a motion is detected. Since it enables it to extract a representation screen when reproducing the recorded information later the digest reproduction/index display which makes it easy to grasp a near program content can be performed extracting a representation screen. And it is especially (1) in the case of this invention. He is \*\* Li for choosing especially the screen before and behind the commercials which the main point is concentrating in the usual program. Digest reproduction/index display screen can express the main point of a program now more exactly.

(2) A commercial part can also be cut at the time of digest reproduction/index display and grasp of a program becomes easier. There is a prominent effect to say.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is a block diagram showing one example of this invention.

[Drawing 2] It is a block diagram showing other examples of this invention.

[Drawing 3] It is a block diagram showing other examples of this invention.

[Drawing 4] It is an explanatory view showing the detection system of a commercial message screen.

[Drawing 5] It is an example in the block diagram which detects the screen of a commercial part.

[Drawing 6] It is an explanatory view of detection (motion detection) of a commercial message screen or a scene change screen.

[Drawing 7]It is an explanatory view of detection (motion detection) of a common scene change screen.

[Drawing 8]It is a flow chart which shows the judgment of a commercial message screen.

[Description of Notations]

1 An antenna and 2 [ A multiplexer2037 microcomputersand 22 / A storage device and 24 / A demultiplexer and 38 / Memory] An image channel tuner4 AD convertersand 5 (5') A scene change (commercials) detector circuit and 13 A voice tuner and 18

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